

# Penn Cambria Curriculum

<b>Course Name</b>	<b>Honors Biology 2</b>
<b>Length of Course</b>	1 Semester – Weighted Course 1.10 credits
<b>Grade Level</b>	11 <sup>th</sup> & 12 <sup>th</sup> Grade
<b>Prerequisites</b>	85% in Honors Biology I or 93% in Biology 1
<b>Course Description</b>	Honors Biology II is an extension of Honors Biology I. This course is designed to provide the student with an in-depth study of biology with an emphasis upon the relationships to man. Selected topics include: DNA, protein synthesis, genetics, human genetic diseases and treatments, cytology, evolution, bacteriology, virology, oncology, cloning, and stem cell research. Various scientists and their landmark works are studied in historical and social context. Honors Biology II is designed for those students who plan on a career in the medical or science-related fields. This course may be taken for college credit through Mount Aloysius College.
<b>Units of Study</b>	The History of Science and the Scientific Method Cytology Cell Division Oncology Search for Genetic Material Genetics Ecology Evolution Bacteriology Stem Cells
<b>Materials</b>	Text: Biology, Sixth Ed. Campbell and Reece, 2002 Supplemental Materials:

## Unit: The History of Science and the Scientific Method

**Estimated Time:** 1 week

**Standard Alignment:** S11.A.1.1 Analyze and explain the nature of science in the search for understanding the natural world and its connection to technological systems. (3.1.10A, 3.2.10A, 3.1.10E)

S11.A.2.1 Apply knowledge of scientific investigation or technological design to develop or critique aspects of the experimental or design process. (3.2.10B, 3.2.10D)

### Curricular Objectives:

- A. Explain the progression of scientific theory through time.
- B. Describe the scientific methods of the Greek philosophers.
- C. Differentiate between the Mechanistic View and the Vitalistic View.
- D. Describe the characteristics of a good scientist.
- E. Explain the importance of publishing scientific discoveries.
- F. Discuss the importance of animal testing to scientific discovery.
- G. Describe how anecdotal evidence can lead to scientific discoveries.
- H. Describe how a double blind experiment is set up.
- I. Explain the placebo effect and its role in scientific experimentation.

- J. List the characteristics of a good scientist and provide an example of famous scientists who possessed each characteristic.

**Assessments/ Measurement of Objectives:**

- Quiz on the scientific method
- Research paper on various scientists and their discoveries.
- Essay Exam

**Suggested Methods of Instruction / Learning Activities:**

- Lab activities/reports
- Simulations
- Individual and/or group projects
- Direct Instruction
- Class discussions
- Study Stations
- Research Activities
- Reading in the content area activities
- Open ended responses

<b>Unit: Cytology</b>
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**Estimated Time: 2 Weeks**

**Standard Alignment: S11.B.1.1 Explain structure and function at multiple levels of organization. (3.3.10A, 3.3.10B, 4.6.10A, 4.7.10B)**

**Curricular Objectives:**

- A. Describe the work of Robert Hooke.
- B. Describe the work of Anton Van Leeuwenhoek.
- C. Explain how Schlieden and Schwann developed the Cell Theory.
- D. Describe the instruments used to study cells.
- E. Describe the process of cell classification.
- F. Describe the characteristics of prokaryotic cells and provide examples.
- G. Describe the characteristics of eukaryotic cells and provide examples.
- H. Explain Carl Woese's domain system of classifying cells.
- I. Identify the organelles found in cells and state the function of each organelle.

**Assessments/ Measurement of Objectives:**

- Quiz on cellular organelles.
- Lab: Microscopes, cells, and organelles.
- Essay Exam.

**Suggested Methods of Instruction / Learning Activities:**

- Lab activities/reports
- Simulations
- Individual and/or group projects
- Direct Instruction
- Class discussions
- Study Stations
- Research Activities
- Reading in the content area activities
- Open ended responses

## **Unit: Cell Division**

**Estimated Time:** 2-3 days

**Standard Alignment:** S11.B.1.1.3 Compare and cellular process (eg. Meiosis and mitosis)  
S11.B.2.2 Describe how genetic information is inherited and expressed. (3.3.10C)

### **Curricular Objectives:**

- A. Describe the phases of Mitosis
- B. Describe the phases of Meiosis

### **Assessments/ Measurement of Objectives:**

- Quiz on mitosis
- Quiz on Spermatogeneisi and Oogenesis
- Essay Exam

### **Suggested Methods of Instruction / Learning Activities:**

- Lab activities/reports
- Simulations
- Individual and/or group projects
- Direct Instruction
- Class discussions
- Study Stations
- Research Activities
- Reading in the content area activities
- Open ended responses

## **Unit: Oncology**

**Estimated Time:** 1.5-2 weeks

**Standard Alignment:** S11.B.2.1.2 Explain the role of mutations, differential reproduction, and gene recombination in changing the genetic makeup of a population.

### **Curricular Objectives:**

- A. Describe the general aspects of cancer and define the various terms used in the study of cancer.
- B. Describe the various environmental carcinogens.
- C. Describe various physiological carcinogens.
- D. Describe the different treatment methods for cancer.
- E. Describe methods of cancer prevention.

### **Assessments/ Measurement of Objectives:**

- Quiz on Oncology vocabulary terms.
- Quiz on cancer research methods.
- Research paper on environmental carcinogens.
- Essay Exam

**Suggested Methods of Instruction / Learning Activities:**

- Lab activities/reports
- Simulations
- Individual and/or group projects
- Direct Instruction
- Class discussions
- Study Stations
- Research Activities
- Reading in the content area activities
- Open ended responses

<b>Unit: Search for Genetic Material</b>
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**Estimated Time:** 3 weeks

**Standard Alignment:** S11.B.2.2 Describe how genetic information is inherited and expressed. (3.3.10C)

**Curricular Objectives:**

- A. Explain how biologists were able to narrow the genetic material down to either the nucleic acids or proteins
- B. Describe and analyze several experiments that led to the discovery of DNA as the genetic material.
- C. Describe the structure and function of DNA.
- D. Describe the process of protein synthesis.

**Assessments/ Measurement of Objectives:**

- Quiz on proteins and nucleic acids.
- SMARTboard Lab: Antibiotic Resistance.
- DNA Transcription and Translation Activity.
- Lab: Sequencing Polypeptides.
- Quiz on the structure of DNA.
- Essay Exam.

**Suggested Methods of Instruction / Learning Activities:**

- Lab activities/reports
- Simulations
- Individual and/or group projects
- Direct Instruction
- Class discussions
- Study Stations
- Research Activities
- Reading in the content area activities
- Open ended responses

<b>Unit: Genetics</b>
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**Estimated Time:** 3 weeks

**Standard Alignment:** S11.B.2.2 Describe how genetic information is inherited and expressed. (3.3.10C, 3.3.12C)

**Curricular Objectives:**

- A. Describe the work of Gregor Mendel.
- B. Solve various types of genetic crosses.
- C. Describe the inheritance and symptoms of various genetic diseases.
- D. Discuss the cloning debate and the procedure that lead to Dolly the sheep.
- E. Discuss the roles of nature and nurture in genetics.

**Assessments/ Measurement of Objectives:**

- Test on the history and experiments of Gregor Mendel.
- Genetic problems worksheet.
- Quiz on genetics vocabulary.
- Quiz on Genetic Diseases.
- Cloning Debate.
- Discussion: Nature vs. Nurture.
- Exam: Genetic problems and essays.

**Suggested Methods of Instruction / Learning Activities:**

- Lab activities/reports
- Simulations
- Individual and/or group projects
- Direct Instruction
- Class discussions
- Study Stations
- Research Activities
- Reading in the content area activities
- Open ended responses

**Unit: Ecology****Estimated Time: 2 days****Standard Alignment: S11.D.2.1 Analyze how the transfer of energy and substances between Earth's atmosphere and its surface influences regional or global weather or climate. (3.5.10C)****Curricular Objectives:**

- A. Describe the phenomenon known as the Greenhouse Effect and how it may contribute to global warming.
- B. Examine data, graphs, and charts involving human's effects on the greenhouse effect.
- C. Examine evidence that global warming is occurring.
- D. Discuss the effects of global warming.
- E. Describe the Earth's Ozone layer and explain why it is getting thinner.
- F. Explain the problems that the thinning ozone layer is and will cause.

**Assessments/ Measurement of Objectives:**

- Quiz on the Greenhouse effect.
- Quiz on ozone destruction.
- Essay Exam

**Suggested Methods of Instruction / Learning Activities:**

- Lab activities/reports
- Simulations

- Individual and/or group projects
- Direct Instruction
- Class discussions
- Study Stations
- Research Activities
- Reading in the content area activities
- Open ended responses

## Unit: Evolution

**Estimated Time: 2 weeks**

**Standard Alignment: S11.B.2.1 Explain the mechanisms of the theory of evolution. (3.3.10C, 3.3.10D, 3.4.10D, 3.3.12D, 4.7.10C)**

### **Curricular Objectives:**

- A. Describe the different techniques used to date fossils and geologic events.
- B. Describe the information that is held in the fossil record.
- C. Discuss several theories about the age of the Earth.
- D. Explain Charles Darwin's theory of Evolution.
- E. Describe the evolution of humans.

### **Assessments/ Measurement of Objectives:**

- Quiz on Geology and the age of the Earth.
- Half life worksheet.
- Quiz on Charles Darwin.
- Essay Exam

### **Suggested Methods of Instruction / Learning Activities:**

- Lab activities/reports
- Simulations
- Individual and/or group projects
- Direct Instruction
- Class discussions
- Study Stations
- Research Activities
- Reading in the content area activities
- Open ended responses

## **Unit: Bacteriology**

**Estimated Time:** 1.5 weeks

**Standard Alignment:** S11.B.1.1 Explain structure and function at multiple levels of organization. (3.3.10A, 3.3.10B, 4.6.10A, 4.7.10B)

### **Curricular Objectives:**

- A. Describe the general structures that are present in bacteria.
- B. Describe the work of various scientists with pathogenic bacteria.
- C. Explain how Louis Pasteur discovered the process of pasteurization.
- D. Describe the various ways that bacteria can be identified.
- E. Explain the process of bacterial reproduction.

### **Assessments/ Measurement of Objectives:**

- Quiz on bacteria.
- Lab: Identify bacteria.
- Quiz on Pathology.
- Essay Exam

### **Suggested Methods of Instruction / Learning Activities:**

- Lab activities/reports
- Simulations
- Individual and/or group projects
- Direct Instruction
- Class discussions
- Study Stations
- Research Activities
- Reading in the content area activities
- Open ended responses

## **Unit: Stem Cells**

**Estimated Time:** 1 week

**Standard Alignment:** S11.B.1.1.3 Compare and contrast cellular processes.

### **Curricular Objectives:**

- A. Describe the characteristics that distinguish stem cells from other cells.
- B. Differentiate between embryonic stem cells and adult stem cells.
- C. Discuss the controversies and the laws that surround embryonic stem cells.
- D. Discuss the advancements made in the field of Regenerative Medicine.
- E. Describe how stem cell research could lead to cures or treatments for many different diseases.
- F. Discuss the obstacles that must be overcome before regenerative medicine becomes a common practice.

**Assessments/ Measurement of Objectives:**

- Quiz on stem cells.
- Discussion about the controversies that surround stem cell research.
- Essay Exam

**Suggested Methods of Instruction / Learning Activities:**

- Lab activities/reports
- Simulations
- Individual and/or group projects
- Direct Instruction
- Class discussions
- Study Stations
- Research Activities
- Reading in the content area activities
- Open ended responses